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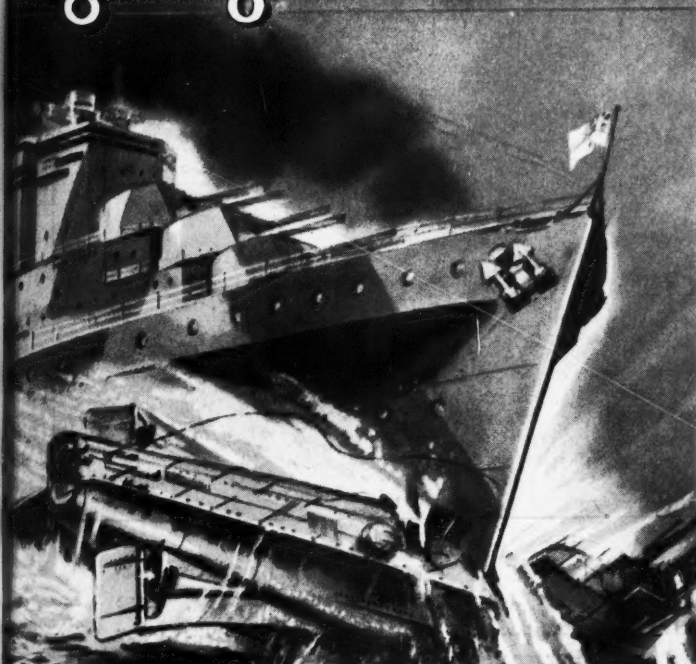
XXXVI.—No. 1

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# LIGHT AND LIGHTING

32, Victoria St.,  
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Edited by J. STEWART DOW

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ABBEY 5215

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## Codes of Lighting The Scientific Background

"CODES of Lighting" are in existence, not only in this country but in the United States of America and in Australia.

So far as values of illumination are concerned, all admittedly represent "good practice," yet this does not imply that they have no scientific basis—only that this scientific basis or background is not evident.

The recent paper by Mr. H. C. Weston (see page 4)—surely one of outstanding importance—affords, firstly, a scientific background, based on the result of actual experiments applied with a shrewd eye to practical possibilities, secondly, a means by which the value assigned to any particular process may be put to the proof by the expert.

If and when these suggestions are adopted we shall have basic standards of illumination arranged in more logical sequence—though it may well prove that little actual change in the majority of values so far assigned to industrial and other operations will be found necessary.



### Black-out Relief?

There have been recently statements in the daily Press that some little relief in the black-out is contemplated. In our last issue we advised public lighting engineers to be prepared for some degree of restoration of public lighting even before the war is over. But, we added, "the time is not yet," which, we gather, is the view of the authorities. Nevertheless, several possible directions of relief have been suggested. Local authorities may be encouraged to make fuller use of the present "synthetic starlight" (0.0002 ft.c.); many towns and cities have not yet availed themselves of this relief, which, though small, is worth having. A little more light may be allowed in railway stations and in open places where essential work is done, and in trains and public vehicles. Motorists may also be encouraged to use somewhat brighter headlights. Admittedly many drivers use very much less light than they are allowed to do. This is a natural result of a defect in existing regulations, often emphasised, namely, that all the stress is laid on the fact that the upper limit must not be exceeded. No effort is made to ensure that a certain *minimum*, equally necessary, is furnished.

### The Height of Buildings Are Lifts for Low-Rented Flats Economical?

Mr. Beckett's contribution on this topic and the ensuing correspondence in the I.E.S. Transactions\* has excited much interest. Mr. T. C. Holdsworth sends us particulars of a scheme carried out by the Housing Director of Leeds, Mr. R. A. H. Livett, who is a firm believer in buildings having up to ten stories and served by lifts, even for relatively poor people. The scheme provides for nearly 1,000 flats in the Quarry Hill Estate. What is stated to be the largest order for lifts ever placed in England—for eighty-eight in all—has been given. Only two flats are entered from any landing. The lifts are fully automatic. All entrances to blocks are from roads within the perimeter of the estate, and the high buildings permit of greater space between blocks to ensure ample daylight. All flats have private balconies at the sunny side of the blocks, and living rooms are similarly placed. The maximum rents are 9s. 10d. per week and 16s. 10d. per week for respectively the smallest flat for aged couples and the largest of six rooms. These prices include rates, water, rateable value fixed charge for electricity, communal wash-house, etc. These are interesting data which certainly tend to show that high buildings, with the attendant advantages in regard to entrance of daylight, are practicable.

\* Trans. Illum. Engg. Soc. (London), July and October, 1942.

## Science and the Nation

At intervals scientists seem to become class-conscious, to awake and demand fuller recognition. Such crises usually arise during periods of stress such as the present war. It is a frequent reproach to Governments that insufficient use is made of the services of scientists. Almost invariably, however, authorities are able to present what is apparently a very formidable advisory organisation. Yet scientists remain uneasily conscious that all is not well.

So we see, from time to time, efforts being made to establish something in the nature of a trade union, sometimes rather oddly confined to votaries of what is termed "pure" science. We have before us a circular from the "Joint Council of Professional Scientists." The main operative bodies appear to be the Institutes of Chemistry and Physics, each with six representatives. Botanists, zoologists, mathematicians, and geologists come off less well with single representatives.

There are, of course, other bodies representing pure science not named, from the Royal Society downwards, and there remains the vast army of those concerned mainly with applied science, amongst whom illuminating engineers may claim to rank. We have a feeling that any movement powerful enough to make a permanent impression on present official structures will need the concerted efforts of scientists of all types. A clear conception of main objects to be attained is also wanted. Perhaps one of the most vital is the introduction of scientific *method* and *outlook*, not merely amongst those serving in a humble advisory capacity, but in the exalted circles where history is made and decisions are taken.

## More Problems

It has been remarked that "problems" and "brains trust" meetings have proved popular amongst the Centres recently. In the latter class was the meeting held on January 14

by the Cardiff Centre (congratulations on its new status!), with Professor T. David Jones as question master. In the former class we note a successful meeting held by the Glasgow Centre on December 9, when Messrs. Hale, Hime, and Lawrence dealt in succession with "Photo Electric Cells," "Ultra-Violet Light," and "Lighting in the Motor-Car Industry." Mr. Hale chiefly discussed photoelectric photometers. Mr. Hime pleaded for a fuller understanding of u.v. radiation. Mr. Lawrence showed that the problems of lighting motor-car bodies (involving the simultaneous use of diffused and directive lighting and the avoidance of trouble due to incomplete heat dissipation and possible mechanical damage to reflectors) had not yet been fully solved. In opening the proceedings the chairman (Mr. J. H. Scott) alluded to the sad loss of Mr. T. Nisbet, recorded in our last issue.

## Forthcoming I.E.S. Meetings

### 1943

**Feb. 9th.** DR. K. J. W. CRAIK, MRS. S. J. MACPHERSON, DR. W. S. STILES and DR. W. D. WRIGHT on **The Effectiveness of Lighting: its Numerical Assessment.** (Sessional Meeting at Gas Industry House, 1, Grosvenor Place, London, S.W.1.) 5 p.m.

**Feb. 3rd.** MR. H. C. WESTON on **The Basis and Structure of an Industrial Lighting Code.** (Meeting of Newcastle Centre, Minor Hall, Oxford Street, Newcastle-on-Tyne.) 5.30 p.m.

**Feb. 3rd.** MR. H. WHEELER on **Problems to be faced by an Electrical Contractor.** (Meeting of Sheffield Centre at the Central Library, Surrey Street, Sheffield.) 6 p.m.

**Feb. 11th.** MR. R. W. J. COOKRAM on **Marine Safety Apparatus: Self-Igniting Lifebuoy.** (Meeting of Cardiff Centre at the Newport Technical College.) 3.30 p.m. [

**Feb. 19th.** THE PRESIDENT (MR. R. O. ACKERLEY) on **Seeing is Believing.** (Meeting of Nottingham Centre. Luncheon at 1.15 p.m., in Mikado Cafe, followed by meeting at 3.15 p.m. in the Lecture Theatre of the City of Nottingham Gas Department, Parliament Street, Nottingham.)

## Proposals for A New Lighting Code

(Proceedings at the I.E.S. Sessional Meeting held in London on Tuesday, January 12, 1943)

There was a good attendance to hear the paper read by Mr. H. C. Weston before the I.E.S. on January 12, and a keen discussion followed despite the somewhat intricate nature of the subject matter. This paper, which will appear in full in "The Transactions" of the Society, should rank high in its annals. Within the space available here it is impossible to do more than give a brief indication of its contents. But I.E.S. members should wait for the appearance of the full text, which they should "learn, mark and inwardly digest" in due season.

The starting point of this work may be said to be Mr. A. W. Beuttell's historic paper read about ten years ago.\*

[It was happily possible for Mr. Beuttell to come up to town specially to open the discussion on Mr. Weston's paper.] In that paper Mr. Beuttell attempted to define the various factors on which performance of any task depends, to give due weight to each, and to assess by means of formulae the requisite illumination for the process. It was pointed out then, however, that many of the data needed were lacking. Subsequent researches initiated by the D.S.I.R., for which Mr. H. C. Weston was mainly responsible, on the relation between illumination and size of work, contrast, etc., have gone far towards making good this deficiency.

### The Existing I.E.S. Code.

In the meantime, the I.E.S. Code, admittedly based largely on what is believed to be "good practice," had taken shape. This has come into con-

siderable prominence during the war, owing its adoption by the Production Ministries for the lighting of factories engaged on vital work. It now seems possible to present at least a scientific basis by which these recommended values of illumination can be justified or, if need be, modified eventually. No code can be devised which will relieve the lighting engineer of the onus of applying his intelligence. Admittedly, too, the performance of a given task is not the *only* consideration that determines the nature of the lighting. Nevertheless, it does now seem possible to establish a method by which the illumination needed for carrying out any specific task can be explored. This Mr. Weston sets out to demonstrate.

### 90 Per Cent. Performance

Three main points in procedure may be noted. In the first place, it is necessary to have some starting-point in a series of values of illumination forming a code. Mr. Weston adopts 2 ft.c., the lowest figure in the existing code which derives justification as being about the minimum meeting psychological requirements and affording a moderately cheerful environment. Next, the series of ascending values should be in geometrical order, so that the advantage gained by each increase may be substantially the same. Thirdly, it is necessary to take some standard of performance. Obviously, to aim at perfection—i.e., 100 per cent.—or even near it, would involve impossibly high illuminations for many tasks. Mr. Weston proposes 90 per cent., which seems a reasonable figure in practice and leads to a series of values by no means difficult to furnish.

### An Ascending Series of Values

Later in his paper, the author crystallises results in a table showing a sequence of 13 values, approximating to

\* "An Analytical Basis for a Lighting Code," Illum. Eng., Vol. XXVII, January, 1934.

the series 2, 2<sup>2</sup>, 2<sup>3</sup>—2<sup>7</sup>, etc., ft.c. Corresponding with this series of illumination, which terminates at approximately 126 ft.c., is a series of "angles of critical detail at the eye," which serves as a means of assessing the difficulty of any task, assuming normal condition of contrast. There are other factors, such as speed of action, for which no allowance is made by formula, but it is shown that this is in part taken into consideration in the process adopted and is not an essentially major consideration.

#### Relation between Illumination and Size of Object

Under the conditions assumed, a simple relation between size of object viewed and requisite illumination is found to exist. The relation between size of detail in the task and illumination is shown to be  $E = \frac{64}{S^2}$  for a relative visual performance of 90 per cent., E being illumination in ft.c., and S the size in inches/1,000 of material detail—e.g., diameter. Thus  $E = 64$  ft.c. when the detail subtends a visual angle of 1', and the contrast in the task is good. The illumination determined on the basis of size is multiplied by the reciprocal of the difference of reflection factors in the task, so that the brightness difference presented is made constant and independent of the contrast, as suggested in Beuttell's paper. The upper limit of illumination proposed exceeds 1,000 ft.c., but it is pointed out that this is confined to the work, which may cover only a small area. A graph is given from which the illumination required for any task can be readily found, given the dimensions of the material detail in the task, its distance from the eyes, and the difference of reflection factors involved.

#### Other Factors

The paper deals only with values of illumination, other factors (such as

avoidance of glare and glitter, desirable shadow conditions, nature of background, etc., which must be dealt with in a good-lighting code) being still under consideration.

#### Discussion

The discussion of Mr. Weston's paper revealed a number of knotty points. There was general admiration of the boldness of the conception presented in the paper, though the literal application of some of the ideas appeared to present difficulties.

Mr. A. W. Beuttell, who opened the discussion, and Dr. W. D. Wright both expressed appreciation of the adoption of a 90 per cent. performance requirement, though the former was inclined to suggest that this percentage might be applied on a sliding scale, according to the degree of difficulty of the task. Dr. J. W. T. Walsh approved the adoption of a series of values of illumination with a constant ratio between one value and the next, but he confessed himself appalled at the difficulty of deciding the requirements of any particular task! In this connection he discussed several examples, including the simple process of reading. Was the visual angle to be determined by the width of the stroke of a letter, or the size of the letter or what? Dr. Wright suggested that it was necessary to compromise in a room devoted to different operations—one could not proceed piecemeal and allot different values throughout the room. Mr. Howard Long also discussed this point, remarking on the difference between the general illumination in a room and the variable demands of individual workers. One of the main considerations here is the brightness of the task. Mr. H. E. Chasteney, H.M. Deputy Inspector of Factories, put rather a poser by asking what was the correct visual angle for the grinding of razor blades. He also enquired as to the ultimate possibility of some simple instrument or device, which, in cases of dispute, would enable the

question of adequacy of illumination to be quickly determined.

In the time available Mr. Weston could only reply very briefly to the points raised. He explained that he was not prepared on the spot to resolve any knotty point submitted. The needs of any particular process would need careful study. It did not follow that the exact value of illumination indicated theoretically must be applied in practice. Considerable tolerances would be needed. Mr. Chastaney's idea for a resolving instrument was attractive—but he could not see how it could be devised at present.

## Lighting in the Cotton Industry

A useful supplement to the recent I.E.S. paper on Lighting in the Woollen and Worsted Industry was presented by Mr. J. W. Howell to the Manchester Centre (North Western Area) on January 14. Mr. Howell dealt very fully with the numerous and varied processes involved in the cotton industry which differ materially from those analysed in the previous paper mentioned above. One rather fundamental point is that the value of the finished product is less, with the result that many of the finer inspection processes are eliminated. One of the objects of the paper was to determine requisite values of illumination. In this connection the author has experimented with an empirical formula which assumes that the illumination varies as the square root of the number of "counts" of the yarn used, though colour is also a determining factor. We understand that the meeting proved to be a very successful one, the attendance a record, being swelled by visitors specially interested in the problems discussed.

## Recent British Standard Specifications

### STUDIO SPOTLIGHT LAMPS

The British Standards Institution has just issued a Specification for Studio Spotlight Lamps and Associated Equipment, B.S. 1075-1943. This specification was prepared in response to representations which were made by the manufacturers in view of the fact that these lamps are subject to very strenuous conditions of service. The specification follows the form of the other British Standard Lamp Specifications, with the addition of a section on Lamp Housing Flexible Cables and Cable Lugs.

### IDENTIFICATION OF PIPES, CONDUITS, DUCTS, AND CABLES IN BUILDINGS

As a result of representations made to the Institution that the scheme of identification laid down in the 1935 edition of the above British Standard was not easy of application, a careful review of the comments received has been made, and in consequence a new edition of the specification has just been published.

A modified scheme, in which the identification letters are painted, in a colour contrasting with the basic colour, on the pipe itself, has been substituted for the shaped metal discs required by the original scheme to be attached to the pipe. The basic colours for the different services remain the same, except in the case of some of the sub-divisions of water—about which most comment was received. The system of lettering has also been modified.

The scheme is intended for application to all types of buildings (except chemical works), and this specification should prove of great use to those responsible for the planning of the various services required in post-war buildings.

Copies of the above publications may be obtained from the Publications Department, British Standards Institution, 28, Victoria-street, London, S.W.1, each price 2s. net (2s. 3d. post free).

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(The numbers are those attached to individual entries  
in "Where to Buy")

**Lectures on  
Lighting**

Two lectures arranged by the R.I.B.A. Architectural Science Board on January 23 are worthy of note. On that date Mr. R. O. Ackerley, the I.E.S. president, lectured on Artificial Lighting, and Mr. W. Allen, of the Building Research Station, on Planning for Daylight. Excellent choices for both subjects.

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**I.E.S. Membership Cards**

An enterprising departure by the I.E.S. Birmingham Centre (Midland Area) has been the issue of a very handy "Membership Card," which takes the form of a little booklet containing the Rules of the Centre, with a front

inside page on which particulars of membership (name, address, class of membership, etc.), can be entered. A little pouch provides for the insertion of cards containing the names of current officers and committee and the programme for the session (issued anew each year). We commend this idea to other Centres.

## The Lighting of the House of Commons

Through the courtesy of Mr. Dean Chandler, we have had an opportunity of inspecting a rather curious little volume, which contains a printed account of correspondence between the Speaker of the House of Commons and Sir F. W. Trench, M.P., in regard to the lighting of the House. The first letter is dated February 26, 1839, the last March 20, 1852, so that the argument continued, with intermissions, for about 13 years.

### "Lustres" of Wax Candles

Trench was throughout a champion of the existing "lustres" which utilised candles, contending that all that was needful was to screen the lights, which he proposed to do with calico shades. Whilst these were in course of preparation, he applied for "five yards of green baize, to prevent the eyes of the unfortunate reporters being burnt out," and laments his discovery that nothing could be done without the authority of the Woods and Forests! Later we find him complaining that his ideas could be executed in an hour and would cost only 9s. 4d., whereas more ambitious experiments initiated by Doctor Reid cost £6,545. These experiments included the Drummond Light (a lighthouse illuminant), the Bude Light (apparently an Argand lamp, through the flame of which a stream of oxygen was passed), and a species of gas lighting—on all of which Trench poured ridicule, and which, indeed, do not appear to have been very successful, seeing that in 1852 Dr. Reid was still proposing fundamental changes in the existing arrangements. In this final letter Trench pleaded eloquently for the restoration of the "gentleman's light of good wax candles in order that members might be free to attend to their business without fear of explosion of philosophical lights (whether Bude, Drummond, or any other)."

### Early Gas Lighting

An interesting review of this period in the history of the lighting of the House of Commons is to be found in an early issue of "The Illuminating Engineer."\* It is evident that the pre-

dilection for wax candles died hard, and at one time Dr. D. B. Reid was told, "Do what you will for the acoustics and ventilation, but take it as a settled point fixed and settled point that wax candles remain!" The lighting problem, however, was complicated by that of ventilation, and early efforts to introduce gas lighting were beset by difficulties. A letter written by Lady Louisa Molyneux in 1838 referred to "the dazzling glare which came from 5,000 apertures in gas pipes between the roofs, where the temperature was at 120 degrees and kept rising . . . fire engines in attendance and hose laid along every gas pipe for fear of accidents."

The large gas chandeliers next introduced still caused considerable difficulties, and it is reported that even as late as 1889 (when the lighting of the House was once more the cause of acute controversy) as much as £2,000 figured in the estimates for oil lamps. The solution of the problem of gas lighting was finally effected by the substitution of the yellow tinted glass for the original oak roof, above panels in which gas lights were installed.

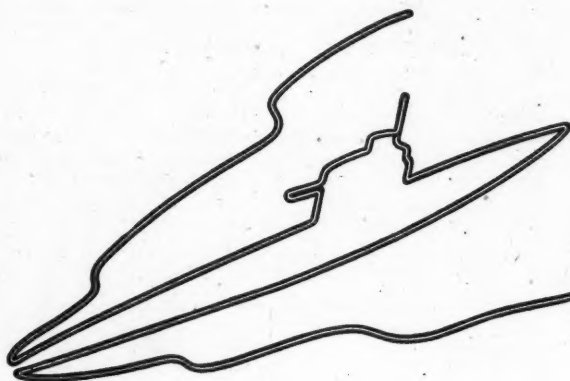
### Electric Light and U.V. Rays

Subsequently electric lighting was introduced, but this, too, has been subject of controversy from time to time. May 16, 1912, was, from the illuminating engineering standpoint, a memorable day in the House of Commons, for on that day Mr. Arthur Lynch, M.P., asked several questions relating to important aspects of lighting. One of these dealt with miners' nystagmus and the study of lighting conditions in mines; another (answered in the affirmative) inquired whether it was proposed to take steps to carry into effect the recommendation of the Departmental Committee on Lighting Accidents (1911) in regard to the fixing of standards of lighting.† a third dealt with the lighting of the House, on which the advice of an oculist, Mr. E. Treacher Collins, had been sought. Experiments with electric lighting had led to this inquiry. Mr. Wedgwood Benn stated that only a single panel had then been experimentally equipped with electric lighting. Criticisms of the change, oddly

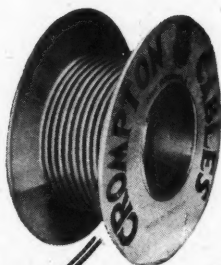
† This was the starting point of the Departmental Committee on Lighting in Factories, whose recommendation that there should be statutory provisions requiring adequate and suitable lighting was only carried out in 1937—twenty-five years later!

\* Vol. II, 1909, p. 663.

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enough, seems to have centred largely round the fear that U.V. rays from the filaments of the electric lamps might damage the eyesight of members. Hence the appeal to Mr. Treacher Collins, who was, however, able to report that as the light would pass through three layers of glass, one in the ceiling panel of amber colour, no appreciable emanation of ultra violet rays need be feared.

#### Adoption of Electric Light

Ultimately electric lighting was adopted. In this connection there was an interesting story, possibly apocryphal, which, whether true or not, illustrates the need for concessions to prejudice in dealing with illumination. It was said that at any early stage in the proceedings panels were converted to

electric lighting one at a time, the circuit being equipped with a rheostat so that an exact colour match with the remaining gas-lighted panels could be secured. The change-over was thus effected gradually without members being aware of it. Afterwards the resistance was cut out gradually, the illumination gradually increasing as the light became of a whiter tint!

#### Future Possibilities

After the war there will be further opportunities for experiment in the lighting of the House of Commons. One may imagine that claims for fluorescent tubes will be made, but, in view of past experience, it will be surprising if such a radical departure is made without some degree of argument.

### Obituary

#### MR. STEPHEN LACEY

We learn with great regret of the sudden death of Mr. Stephen Lacey, which occurred on January 2. Mr. Lacey joined the Illuminating Engineering Society in 1931 and subsequently served on the Council. He took a keen and enlightened interest in its work, more than once expressing his belief in the value of the platform it afforded for those associated with different systems of lighting to meet and exchange views. Mr. Lacey's family has been associated with the Gas Light and Coke Company for ever 100 years, and he himself soon came to take a leading part in its activities, becoming controller of gas sales in succession to Sir Francis Goodenough. He had much to do with the organisation of Watson House, served on the Council of the Institution of Gas Engineers, and on two occasions won the Institution's gold medal for a scientific paper. Mr. Lacey had special qualifications of signal value to the gas industry. He combined scientific and technical knowledge with sagacity, a kindly disposition and a wide outlook. These gifts fitted him well for the task of post-war planning with which he was closely

occupied up to the time of his death. He will be greatly missed, both within the gas industry and by his friends outside of it.

#### DR. ALEXANDER RUSSELL

In the death of Dr. Alexander Russell, who served as principal of Faraday House for over forty years and was associated with that institution for half a century, electrical engineering has lost another outstanding figure. Dr. Russell had versatile gifts of a nature more usual in the Victorian age than now. A brilliant mathematician, he soon became associated with pioneering work in electrical science, and ultimately occupied the Presidential chair of the Institution of Electrical Engineers. He likewise gained the Fellowship of the Royal Society. He was the author of standard works on alternating currents and other topics. He combined with learning shrewdness, geniality, and that human touch which endeared him to many successions of students at Faraday House, a training school unique of its kind. To illuminating engineers his name is also familiar, more especially for the "Russell Method" of determining average candlepower—a process described in practically all standard works on photometry.

# RIGHTING WRONGS

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**Inspection.** Improper placing of lighting units often causes trouble. Each critical inspection operation calls for special study and treatment. Angle lighting may cure bright-surface inspection jobs, vertical or horizontal local lighting can solve other problems. In most cases the use of long, diffuse light sources will help.



**Chart Lighting.** Here eyes must change focus constantly, looking frequently through the pool of light over machine at a less highly illuminated chart, blue-print or scale table. The cure . . . to equalise the illumination on machine and chart.

Let BTH Lighting Engineers help you to plan efficient lighting for production and welfare.



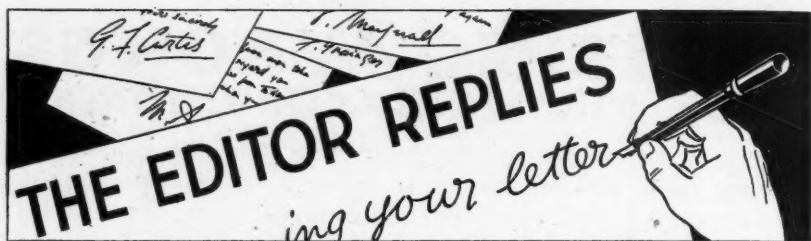
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## SAVE ELECTRICITY — by all means



I have been asked to state correction factors for **photoelectric photometers** applied to sources having widely different spectra. It happens that I have just been noting some such data in the I.E.S. Lighting Review (Australia). Taking 1.00 for tungsten lamps the extreme lowest correction factors come out near 0.50-0.60. Fluorescent red and blue light both require this order of correction. Most other colours are intermediate, but gold and green give high factors, 1.2 to 1.3, and for yellow sodium light it ranges between 1.4 and 1.6!

This presumably relates to normal illuminations. When the light becomes very weak and the Purkinje effect has full play it is difficult to quote factors that give any guide to the relative impression of brightness received by the eye.

Great stress is laid on the use of light colours for walls and ceilings. Why, it has been asked, is **the reflecting power of the floor** so little considered? Perhaps owing to the fear that the surface would not remain white for long. It is, however, significant that advertisements featuring the value of one flooring substance as a good reflector of light have been appearing in the daily Press recently.










Reflection from a light concrete floor may prove very valuable in factories: first, in producing a comparatively light background and diminishing the "tunnel effect"; secondly, in **illuminating the undersides of objects**, for

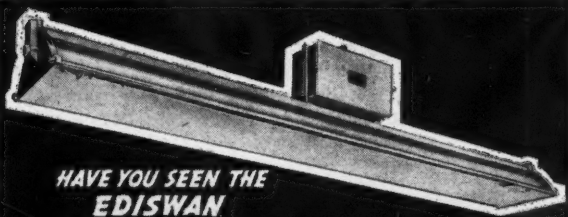
example, aeroplanes, for purposes of inspection. In certain instances the reflection of daylight from the floor may also be definitely helpful. Certainly the point deserves study.

I am reminded by a recent letter from Dr. J. W. Whitaker of a function of lighting—not commonly mentioned but nevertheless important (especially in such places as lecture theatres and churches)—**to keep people awake!**






This applies equally to the audience and to the person holding forth, and supplies an argument for not insisting on a system of lighting that is too restful, such as, perhaps, totally indirect lighting. On the other hand, it is not expedient to introduce unduly bright lights which create glare and distraction, for they, too, have a soporific effect. *In medio tutissimus ibis.*

**The old shallow opal shade dies hard.** I have in mind several large private houses in a highly respectable suburban thoroughfare, formerly standing empty but now taken over as office premises. (Incidentally, this enterprising firm has installed its factory in an adjacent disused Nonconformist chapel!) During the day few lights are visible in adjacent houses. Such as one does see appear to be fully shaded, one might say obscured. But in the group of houses now serving commercial ends all is bustle, and every light is turned on. Unfortunately, shallow shades prevail. From a distance bare filaments may be seen directing their light through the windows—until the black-out mercifully draws a veil.












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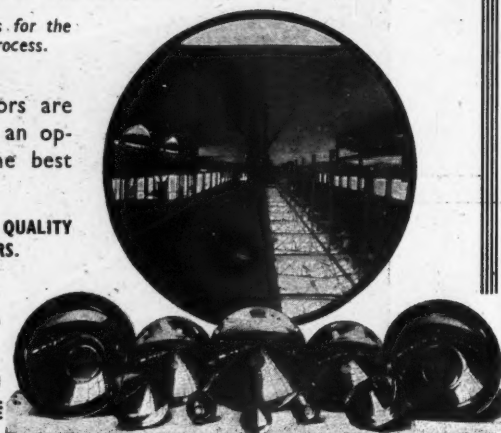
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## Reviews of Books

*Practical Electrician's Pocket Book.* (Odhams Press, London, 1943; pp. 440; Price 3s. 6d., 3s. 10d. post free.)

This familiar pocket book appears once more and attains its fourth year of publication. Its bulk is slightly diminished by present circumstances, but it remains a remarkable assembly of condensed information, in parts rearranged or amplified. The Contents specifies nearly fifty different main sections, which cover a wide range, from agriculture and alternating current motors to water heating, welding, and wiring. The section on lighting is now very complete within the space permissible, and contains descriptions of the latest forms of discharge lamps and an analysis of the conditions under which filament lamps, discharge lamps, and fluorescent tubular lamps may be used with advantage. The section on the design of lighting installations is preceded by a summary of the Factories (Standards of Lighting) Regulations and a statement of the main re-

quirements of the I.E.S. Code. Illumination Photometers are treated separately in the section devoted to Instruments. The design of lighting installations by the aid of tables of utilisation coefficients, etc., is still very fully treated.

*The "Gas Journal" Calendar and Directory.* (Walter King, Ltd., London, 1943; pp. 244, xxxii.)

The new edition of this familiar directory contains the usual information, being divided into two main portions—the Directory and the handbook. The former contains an exhaustive list of gas undertakings not only in the United Kingdom and Eire but also in the British overseas possessions. A very useful feature is the list of public lighting engineers. This section is concluded by a list of gas and allied organisations, institutions, and societies with particulars of the chief officers in each case.

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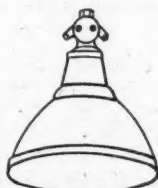
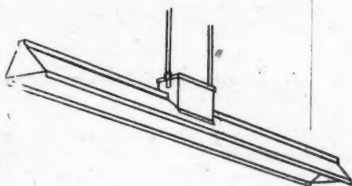
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# Literature on Lighting

(Abstracts of Recent Articles on Illumination and Photometry in the Technical Press)

## PHOTOMETRY

1. **Meters for Measuring "Black-out" Brightness.** A. H. Taylor. *El. World*, 118, p. 810. September 5, 1942. Three patterns of American brightness meters are considered for the measurement of the very low brightnesses met with in "blackout" conditions. The principle of operation is described, and the different ranges available quoted.

S. S. B.

## LIGHTING EQUIPMENT

2. **Portable Fluorescent Unit.** Anon. *Magazine of Light*, XI, No. 7, p. 45, October, 1942. A brief description with photographs is given of portable lighting units using fluorescent tubes.

C. A. M.

3. **Luminous Characteristics of Fluorescent Cloth.** A. H. Taylor. *Magazine of Light*, XI, pp. 38-39, October, 1942. Data are given on the luminous characteristics of two phosphorescent materials. The study includes intensity and duration of illumination to produce saturation, together with data on rate of decay.

C. A. M.

4. **Industrial Light Hood Made of Pressboard.** Edwin D. Tillson. *El. World*, 118, p. 797, September 5, 1942. Details are given of a large trough reflector for tubular fluorescent lamps, designed to use the minimum amount of materials required for war purposes. The main reflector is made of pressboard, with a sprayed enamel surface of high reflectivity. A special wireway is provided, and ribbed diffusing glass panels reduce the brightness in normal directions of view.

S. S. B.

5. **The "Forlamp" Sequence Circuit.** J. H. Campbell. *Magazine of Light*, XI, pp. 14-18, October, 1942. Full details, with circuit diagrams and data on lamp characteristics, are given for the sequence circuit in which four fluorescent tubular lamps are controlled with one common ballast.

C. A. M.

6. **F-lamp Troubles Diagnosed in Field.** Anon. *El. World*, 118, p. 1296, October 17, 1942. A note is given on an American portable testing set, for use on faulty installations of fluorescent

tubular lamps, to test the lamp and auxiliary gear step by step. A long list of tests which can be made is given, but the whole series can be made in a matter of ten minutes.

S. S. B.

## APPLICATIONS OF LIGHT

7. **Engineering Works Lighting.** Anon. *Elect.*, 130, pp. 51-52, January 15, 1943. Details with photographs are given of new lighting installations using mercury vapour discharge lamps in an engineering works. Resulting illumination values varied according to the particular process in hand. For work conducted to fine limits, 40 foot-candles were obtained.

C. A. M.

8. **Lighting to Detect Small Colour Differences.** A. H. Taylor. *Magazine of Light*, XI, pp. 35-37, October, 1942. Spectral transmission or reflection data are suggested for the detection of small colour differences in textiles, papers, paints, etc. The effect of fading or of an extra coating of paint is readily detected.

C. A. M.

9. **Anti-Sabotage Under Dock Lighting.** Anon. *El. World*, 118, p. 976, September 19, 1942. Methods are described for lighting the space under piers, docks, and wharves, for safety measures. Lighting on the docks themselves tend to make the task of seeing below them extremely difficult. Following experiments, a number of different solutions are put forward.

S. S. B.

10. **Banked Units Light Dental Surgery.** Floyd Sell. *El. World*, 118, p. 1152, October 3, 1942. An unusual system of lighting for a dentist's chair is described, designed to avoid undesirable features of ordinary methods quoted. Tubular fluorescent lamps are used, arranged in a wide bank, in white enamelled reflectors; and an illumination on the head-rest of 175 foot-candles is claimed, with a complete absence of glare or of shadow.

S. S. B.

11. **Lighting Engineers Study Sky Glow.** Anon. *EL. World*, 118, p. 930, September 19, 1942. Tests made in America are described in some detail, in an endeavour to determine the magnitude of sky glow with varying amounts of ground lighting. Observations were made from three stations (two on land and one at sea), and successive stages of blackout were arranged over a wide zone. A number of different tests were made, and curves showing some of the results are given.

S. S. B.

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